Title: Asian Homes

Brief Overview:

Students will research and compare various styles of Japanese, Korean, and Chinese architecture. They will display their results in a Venn diagram, a scale drawing, and a model. Students will demonstrate an understanding of solving proportions and using fractions and decimals in a real-life situation. Based on a population problem, students will design a new type of Chinese housing that resembles traditional structures. Students will give a written explanation of their design and material needed to construct their proposed building.

Links to NCTM Standards:

- **Mathematics as Problem Solving**
  Students will demonstrate their ability to solve mathematical problems by designing and constructing a building based on information researched with real-world problems.

- **Mathematics as Communication**
  Students will demonstrate their ability to communicate mathematically by explaining their model in writing and making a presentation to the class.

- **Mathematics as Reasoning**
  Students will demonstrate their ability to reason mathematically by presenting their justification of their materials and construction of their model.

- **Mathematical Connections**
  Students will demonstrate their ability to connect mathematics to science-related activities, information taught in geography, and incorporate writing skills.

- **Number and Number Relationships**
  Students will apply ratios and proportions in their scale drawing and their model.

- **Computation and Estimation**
  Students will multiply and divide decimals and fractions. They will write an appropriate proportion for their scale drawing and model and solve it.

- **Algebra**
  Students will demonstrate their ability to solve algebraic expressions using density formulas in science. They will identify and solve proportions used to make their scale drawings and the models.

- **Geometry**
  Students will create a two-dimensional scale drawing and a three-dimensional model.

- **Measurement**
  Students will demonstrate and apply concepts of measurement using metric units. They will determine the area of various polygons and the circumference of a circle.

Grade/Level:

Grades 6-8

Duration/Length:

This activity including the presentations will take 10 days of math classes and 10 days of science classes.

Prerequisite Knowledge:

Students should have working knowledge of the following skills :

- Basic computations including fractions and decimals
- Writing and solving proportions
- Similar figures
- Metric measurement
- Find area

Objectives:

Students will:

- demonstrate knowledge of solving proportions.
- make accurate calculations.
- work cooperatively in groups of 4-5 students.
- demonstrate knowledge of solving equations.
- demonstrate an understanding of area.
- demonstrate an understanding of the likenesses and differences in Korean, Japanese, and Chinese houses and architecture.
- demonstrate knowledge of appropriate materials to build a real-life structure.
- present a model and written explanation to justify their final design and materials.

Materials/Resources/Printed Materials:

- Encyclopedia- Information on architecture, China, Japan, Korea and shelter
- Books on Chinese, Japanese and Korean homes and architecture
- Pride 2 web site
- Paper, pencils, glue, tape, markers, and metric rulers
- Calculators
- Worksheets
- Meter sticks
- Grid paper
- Materials for building the model will be supplied by the group

Development/Procedures:

Day 1:

- Students will research the exterior characteristics of Korean and Japanese houses and architecture in the library and on the Internet in order to create their scale drawings. They will complete the Japanese and Korean columns of worksheet 1 (Chart of characteristics). If necessary, students will complete these two sections for homework.

Day 2:

- Students will research the exterior and interior characteristics of Chinese housing and architecture using the same sources listed above. They will complete the Chinese column of worksheet 1 (Chart of characteristics).

Day 3:

- Students will form groups of 4 or 5. The group will use worksheet 1 to complete worksheet 2 (Venn diagram). They will also review solving proportions. These activities will be completed in math class. In science class they will complete labs on density to help determine appropriate materials for a building. They will gather data on worksheet 3 (Density lab and table). Review solving equations.

Day 4:

- Students will complete a sample scale drawing of the gym using worksheet #4. They will also determine the area of the gym. They will list possible uses of the gym and discuss the advantages of this type of room on our campus.

Day 5:

- Students will receive worksheet 5 (Scale Drawing). They will begin scale drawing of a Japanese or Korean house. Each student will have specific proportions to write, solve and draw.

Day 6:

- Scale drawings will be complete by the end of the class. Students will begin the introduction of their model project. They will review their information on population density of China from their geography class. They will begin their design of the model.

Day 7:

- Students will complete their designs and have them approved by the teacher. They will begin to construct the model. They will also begin writing the justification of materials and designs(worksheet 6).

Day 8:

- Students will continue to build their model. They must complete a rough draft of their justification.

Day 9:

- The completion of the model and the final draft of the written explanation are due at the end of class. Students will prepare presentations for the following day.

Day 10:

- The groups will present their model and explanation.

Performance Assessment:

The students will be evaluated on their Venn diagram, scale drawing, model and written explanation using 4 different scoring rubrics.

Extension/Follow Up:

Students will critique their models and make revisions after their initial presentation. Each group will identify problems that could be encountered in this living environment and generate proactive solutions. Students will also investigate uses for undeveloped land that can possibly become a new city.

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Worksheet #1

Name:
Date:

Chart

Directions: You will visit the library and the Internet to research information about Japanese, Korean, and Chinese houses and architecture. You will find important information on the Pride II web site. The address is http://www.intandem.com/NewPrideSite/Asia/Asia_Pride.html. Once you reach the web site, go to Nav. Station link. Then go to Asia link followed by the faculty room link. Then go to My House - Your House link. Visit the various links that are associated with houses. These sites will provide details as well as pictures. It is imperative that you also use any reference materials in the library especially the encyclopedia. For greater success in the encyclopedia, try architecture, shelter, and the three countries. Use the chart below for your individual notes.

Korea	Japan	China

Answer Sheet to Chart (Worksheet #1)

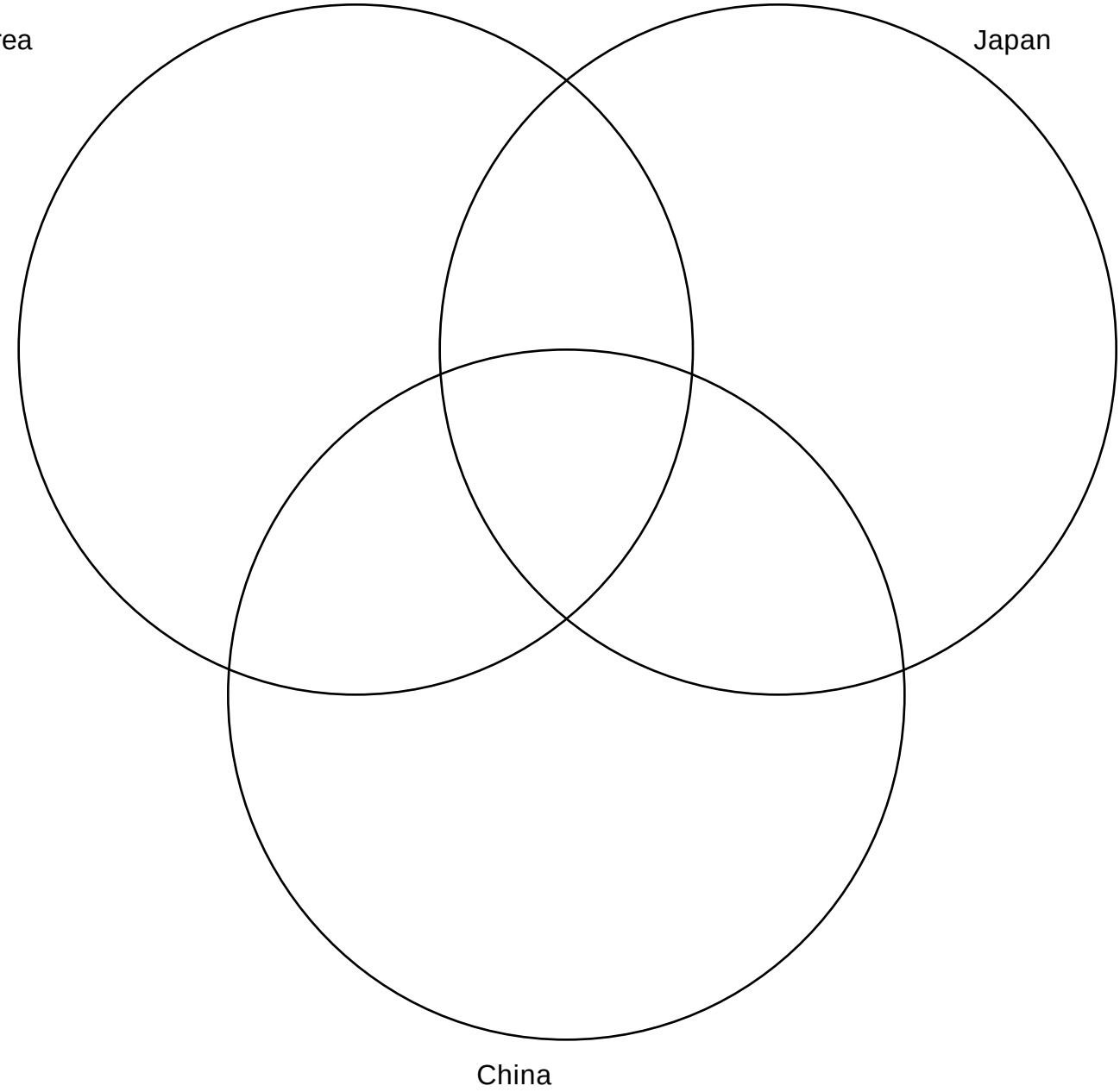
Korea	Japan	China
1 story	1 story	1 story
3 rooms	1-4 rooms	1 room
kitchen, living room, bedroom	sliding paper doors or walls	no indoor walls
stone or crude brick exterior	wooden exterior	bamboo, wooden, brick & tile
some bamboo houses	light colored wood	dark colored wood
thatch roof	wooden posts and beams	some bamboo + clay houses
stone floors	ramp outside house to garden	garden linked to house
little furniture	little furniture	some straw roofs w/ mud house
	no beds, sleep on quilts	some dirt floors
	buildings blend into nature	little furniture
		pagodas- octagonal
		low sloping roof extends past
		Beijing square compound
		highlands have cave homes
		yurts - large tents
		buildings blend into nature
NOW	NOW	NOW
Western style houses & apartments	Western Style houses & apartments	Western Style houses & apartments

Worksheet #2

Name:

Venn Diagram of Asian Housing

Directions: Using your notes from worksheet 1 to compare the three types of Asian houses, complete the Venn diagram**.**



Worksheet #3

Density Lab

Purpose: To investigate which materials are the most dense.

Hypothesis: (complete before starting lab)

Materials:

aluminum	tin	2-1000 ml graduated cylinders
plastic	steel	aluminum pan
iron	bamboo wood	triple beam balance
oak wood block	brick	water
gravel	clay	bucket

Procedure:

1. Collect each of the items for your group.

2. Fill the bucket with water. Place 500 ml of water in one of the 1000 ml graduated cylinder.

3. **To find the Mass**: Using the triple beam balance, find the mass of each sample (aluminum, tin, plastic, clay, iron, steel, oak wood block, bamboo wood block, and gravel). Record each mass in the appropriate column of the chart.

4. **To find the Volume:**
   a. Find the volume of the water in the graduated cylinder.
   b. Record it on the chart.
   c. For your sample of aluminum, drop it in the graduated cylinder with the water.
   d. Record the new measurement of the water level.
   e. Find the difference that the water level rose. Subtract your beginning measurement from your final measurement. Record the answer on your chart.
   f. Repeat this step for each of your samples.

5. **To find the density** of your samples, divide the mass by the volume for each sample that you have. Place the answer in the appropriate column of your chart.

Questions:

1. Which object was the most dense? least?
2. How can we use the density of materials in building a house?
3. Where would we need more dense materials?
4. Where would we need less dense materials?
5. Which materials do you expect to be more flexible? Why?
6. Investigate and list various materials that are used in building modern houses. Be sure to include how they are used in a building and how long they last.

Name:
Date:

Density Chart

Sample	Mass (g)	Volume begin.	Volume end	Difference (ml)	Density (g/ml)
aluminum					
tin					
plastic					
iron					
steel					
bamboo					
oak					
brick					
gravel					
clay					

Worksheet #4

SCALE DRAWING ACTIVITY

We will use one of the largest areas in our school to make a sample scale drawing and to determine the utilization of the area. Each group will be making a scale drawing of the floor plan of the gym.

Answer these questions.

1. What things are necessary for a floor plan?

2. What is the measure of the length of the gym? width?

3. What is the measure of the length and width of the bleacher?

4. What is the measurement of the doors?

5. What is the distance from the doors to the bleachers?

6. Using a scale of 3 cm to 5 m, write the proportion necessary to find the scale length of each measurement made above. Then calculate these measurements.

7. On the grid paper provided draw to scale the gym.

8. What are the uses of the gym?

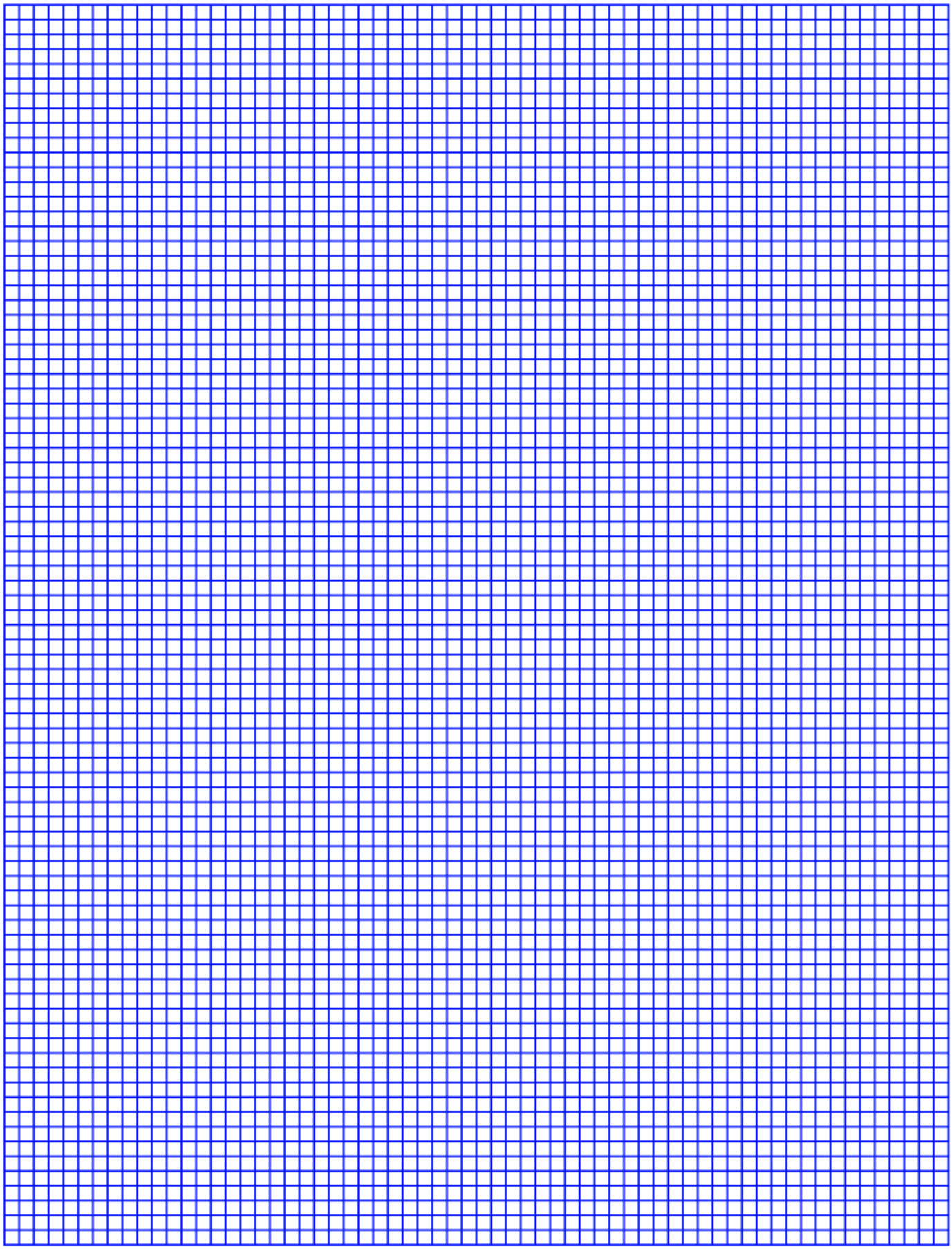
9. What are the advantages of the set up of the gym?

10. What do we do to accommodate other activities?

11. What measurement is important in the utilization of space?

12. Calculate the area of the gym.

13. If we were making a model of the gym, is there anything we would need to add to our information collected? List these.



Worksheet #5

Scale Drawing Directions

Each group will decide on a Korean or Japanese house to be drawn to scale. Use the scale 3 cm to 1 m to complete the proportions. The drawing will be completed on the grid paper. Each member of the group is responsible for completing the drawing. All proportions should be on one sheet of paper with names to identify the person that did the calculations. Be sure to label each proportion with a corresponding segment. Remember to refer to your drawing of the gym for assistance.

Worksheet #6

Rebuilding the China Within

Problem and Directions

With over one billion inhabitants, China is faced with the problem of finding housing for all of its citizens. In more recent centuries, Chinese architecture has solved this problem by building apartment buildings that resemble Western architecture. Thus, Chinese symbols are losing their rich cultural architecture.

You will work in a group to design a building that will house large numbers of people and resemble traditional Chinese architecture. Your design should be based on your Venn diagram and any other information that you have researched during the course of the project. Once your group has decided upon a design, you will create a model as well as write an essay.

To begin your construction of your model, follow the steps below:

1. In your group, create a design for your building.
2. Use your design plans to create a floor plan of one of the levels of your building.
3. Each member of the group is to pick one section of the outer model to identify and solve the proportions . Then you will construct that section of the model.
4. Be sure to label all parts for the proportions.
5. One level must be able to be removed to look at the floor plan of another level.
6. You may use any materials you would like to construct your model. The base of every model will be provided.

In your essay, you will describe your model and the choices that you made. In addition, your essay should address the following questions.

1. How many people does your building house?
2. Which aspects of traditional Chinese architecture are included in your design?
3. Why did you choose these aspects?
4. What materials would you use to build your house? (Be specific!)
5. Why did you choose these materials?
6. Where would you acquire these materials (natural resources or are they imported?)
7. How much do the building materials cost?

Name:
Date:

Venn Diagram Rubric

3 pts.	Thorough characteristics of each traditional style of architecture.
2 pts.	Some characteristics of each traditional style of architecture.
1 pt.	Missing most major characteristics of traditional architecture.

Proportion/Scale Drawing Rubric

2 pts.	Correct calculations, accurate proportions, lines are drawn in correct measure.
1 pt.	Some errors in calculations, proportions, and line measurements.

Model Rubric

6 pts.	Calculations are correct. Applied appropriate scale to proportions. Model is realistic and meets the requirements. Model reflects creativity.
4 pts.	Most calculations are correct. Applied appropriate scale to proportions. Model is realistic and meets most requirements.
2 pts.	Some calculations are correct. Model is unrealistic and doesn't meet requirements.
0 pts.	No calculations are present for the student or calculations are all incorrect. Model is incomplete or unacceptable.

Essay Rubric

6 pts.	Thoroughly explains the model and decisions made by the group. Addresses the population and architecture requirements. Answers all of the questions from the directions. Overall ideas are creative. Shows grammatical accuracy and is in final draft form.
4 pts.	Moderately explains the model and decisions made by the group. Addresses the population and architecture requirements. Answers most of the questions from the directions. Overall ideas are creative.
2 pts.	Explanation meets minimal requirements. Does not address the population and architecture requirements. Answers few questions from the directions. Overall ideas reflect American homes as opposed to Chinese.
0 pts.	Explanation is incomplete.